break up during the periodical storms in September and October, and enable him to reach Port Dickson, where he intended to winter. If to this is added the statements made by Mr. Leigh Smith and Sir Henry Gore Booth, as to open water north and east of Novaya Zemlya during the summer, it is not improbable that the *Dijmphna* has got free in October, and safely reached Port Dickson, or, perhaps, even Port Aktinia on the Taimur Island. Should this be the case, Lieut. Hovgaard has, no doubt, despatched a messenger to the nearest habitation, viz. Goltochicha, and thence by express to Jeniseisk, and we may therefore look forward to reassuring news from the gallant Danish explorer at the end of January or early in February.

THE results of a fourth years' observations of periodic movements of the ground as indicated by spirit levels at Secheron, are given by M. Ph. Plantamour in the *Archives des Sciences* of December 15. The curves obtained from the east-west spirit level, for the four years, are strikingly similar in the manner (pretty regular generally) in which they follow the thermal oscillations of the air. Different years show a notable difference in the epoch of maximum descent of the east side relatively to the minimum of mean temperature, and maximum rise of the same side relatively to the maximum of temperature. One is led to consider the maximum and minimum of temperature rather as accidents as regards the epoch at which they occur, and to attribute a preponderant influence to the distribution of mean temperatures during the four months November-February, and the four June September. Probably, too, the degree of moisture influences largely the rapidity with which the deeper ground layers are affected by exterior temperature. The curve for the north-south level is also very similar to the previous ones; but has this peculiarity, that while the south side follows, in general, from October 1 to the end of September, the oscillations of external temperature (descending in winter and rising in summer) the intermediate variations of temperature have an inverse effect. The cause is at present unknown. Col. van Orff's observations at Bogenhausen reveal oscillations of the ground similar to those at Secheron, only with greater amplitude south-north, and less east-west. M. Plantamour regrets that, excepting Col. van Orff and M. d'Abbadie, no one, so far as he knows, has undertaken observations of the kind at any other station. They are easily made, and should yield important results.

NEARLY thirty years ago, Poggendorff described a "fall-machine" of his invention. Its merits, according to Herr Bauer, who spoke warmly in commendation of it at a recent meeting of philologists and schoolmasters in Karlsruhe (*Wied. Ann.*, No. 13), appear to have been somewhat overlooked. Few physical cabinets have it, and the only text-book in which Herr Bauer has found it described is that of Reis. We may state that the two pulleys over which the cord runs are at the middle and one end of a balance beam, a weight being hung from the other end (with which, and a running weight, the beam can be rendered horizontal). The machine is supplied by Herr Karl Sickler in Karlsruhe.

THE *Nation* states that from Mr. Agassiz's annual report on the condition of the Museum of Comparative Zoology it learns that it is his intention, in connection with Prof. Faxon and Dr. Mark, to issue in the Museum Memoirs a "Selection from Embryological Monographs," containing quarto illustrations derived from innumerable scientific transactions and periodicals, and serving as an atlas for any text-book on embryology. By the purchase of the large Schary collection of Bohemian Silurian fossils, and by its own rich amassing in the West and South-west during the year, the museum now contains one of the finest collections of palæozoic fossil invertebrates in existence. Mr. Samuel Garman, whose explorations for mammalian remains in the Western Territories were very successful, was led to believe from the mode of their accumulation that the cause of extinction of the more recent was "a very severe winter, much more extensive and severe" than the occasional blizzards of our time. "As if from freezing, the shafts of the larger bones are generally splintered."

WE have received the *Annuaires* of the Bureau des Longitudes and of Montsouris Observatory, both of them abounding with useful information on many subjects. Gauthier-Villars is the publisher.

THE additions to the Zoological Society's Gardens during the past week include two Macaque Monkeys (*Macacus cynomolgus* ♂ ♂) from India, presented by Mr. J. Steel; a Black-footed Penguin (*Spheniscus demersus*) from South Africa, presented by Mr. John Wormald; a West Indian Rail (*Aramides cayennensis*) from West Indies, presented by Mr. E. H. Blomefield; an Orange-winged Dove (*Leptoptila ochroptera*) from Brazil, presented by Mr. C. A. Craven, C.M.Z.S.; a Long-eared Owl (*Asio otus*), British), presented by Mr. — Dyer; a Great Barbet (*Megalæma virens*), a Silky Starling (*Sturnus sericeus*), two Grey Thrushes (*Turdus cardis*), twelve Red-sided Tits (*Parus varius*) from Japan, a Crested Grebe (*Podiceps cristatus*), four Razorbills (*Alca torda*), a Red-throated Diver (*Colymbus septentrionalis*), British, purchased.

OUR ASTRONOMICAL COLUMN

THE GREAT COMET OF 1882.—The first determination of elliptical elements of this comet by Mr. S. C. Chandler, of Harvard Observatory, U.S., assigned a period of revolution of about 4000 years. Later investigations have diminished this period very considerably, though the length of revolution is not determined within narrow limits. Prof. Frisby, of Washington, employing observations on September 19, October 8, and November 24, gives a period of 794 years, and finds a close agreement between the position indicated by his orbit and the Cape ante-perihelion observation of September 8. Dr. Kreutz, of Berlin, using chiefly meridian observations or normal places from September 8 to November 14, gives 843 years, and finds a pretty close accordance with observation throughout this interval, thus showing no very material perturbation at perihelion passage. Further, Dr. Morrison, of Washington, founding his calculation upon positions for September 19, October 8, and December 11, finds a period of 652½ years. But while these later computations favour a shorter revolution than was at first attributed to the comet, there remains to be ascertained to what extent the abnormal form of the nucleus since the end of September has affected the observations, and hence the deduced elements of the orbit, and a much more complete discussion of the observations than has yet been attempted, when details respecting the point of the comet observed are before us, may be required before confidence can be placed in the result of any calculation. *Primâ facie* the elements assigned by Dr. Kreutz look satisfactory enough.

In view of a possible period of seven or eight hundred years, attention may be again directed to the comet of 1106, which had several characteristics favourable to identity, though the statement in several of the chronicles (chiefly English) that at the latter part of its appearance it was seen between the north and east, is not reconcilable therewith. Pingré, advocating the identity of the comet of 1106 with the great comet of 1680 (in which he followed Halley) rather questioned the authority of the *Chronicon Alberici, Trium-fontium Monachi*, that the tail extended "below the constellation Orion," which might have been the case if the comet were identical with either of the comets of 1843, 1880, or 1882; he remarked, the monk was "ni contemporain, ni exact, ni judicieux." This subject will deserve further attention, and we may return to it shortly.

THE WASHINGTON OBSERVATORY, U.S.—The first volume of "Publications of the Washington Observatory of the University of Wisconsin" has just been issued by the director, Prof. E. S. Holden, and augurs most favourably for the reputation of this institution, which was founded within the last five years through the liberality and scientific spirit of a private individual, the Hon. C. C. Washburn. The volume is especially

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valuable, from its containing a large number of measures of double stars made by Mr. S. W. Burnham during his temporary connection with the Observatory, from April 23 to September 30, 1881. The measures are contained in three catalogues: (1) a list of sixty new double stars discovered in the zone observations, chiefly by Prof. Holden; (2) a list of eighty-eight new double stars discovered and measured by Mr. Burnham; and (3) measures by the same eminent observer of 150 double stars from his manuscript general catalogue. A number of difficult objects are included in the third series. 8 Sextantis was not elongated with the highest powers at the epoch 1881·34, nor did γ Coronæ show any sign of duplicity; as Mr. Burnham remarks, "it has been apparently single with all apertures since about 1871." Among the more difficult binary stars there are measures of O.Σ. 235, Σ 3123, 42 Comæ, Σ 2173, β Delphini, δ Equulei, and 85 Pegasi. There are also positions and descriptions of eighty-four red stars, of which twenty-seven are stated to be new, and a list of new nebulæ and clusters discovered in the zone-observations at the Washburn observatory.

The position of the observatory is in latitude 43° 4′ 36″·6 N., and longitude 89° 24′ 28″·3 west of Greenwich. Prof. Watson, of Ann Arbor, Michigan, was first appointed to the superintendence, but at his premature death in November, 1880, he had not been able to commence astronomical observations. Prof. Holden gives some account of the preparations he was making for scientific activity, as the only way of associating his name with the observatory.

CHEMICAL NOTES

HERR LELLMANN (*Berichte*, xv. 2835) describes an interesting case of *physical isomerism.* Dibenzyl-diamido-dibromdiphenyl melts at 195°; if the liquid so produced is quickly cooled, the solid now melts at 99°, but on heating again solidifies at 125° to 130°, and melts a second time at 195°; if the substance melting at 195° be slowly cooled and then again heated, the melting point now observed is 195°.

BERTHELOT AND VIELLE (*Compt. rend.* xcv. 129) sum up the results of their researches regarding explosive waves. The propagation of an explosive wave occurs when the ignited stratum of gas exerts the maximum pressure on the adjacent stratum; increase of pressure is accompanied by increased velocity of propagation. To produce an explosive wave it is necessary that a considerable mass of gas should be employed and that the cooling by radiation and conduction should not be great; if the temperature fall below 1700°-2000°, or if the volume of the products of combustion is less than one-fourth, or in some cases one-third of the total volume of the final mixture, the propagation of the wave ceases.

ACCORDING to the experiments of M. Corne (*J. Pharm. Chim.*, [5] vi. 17) the glowing of phosphorus is due to volatilisation of the phosphorus and subsequent production of ozone by electrical energy generated by the volatilisation of the phosphorus. Phosphorus does not glow in pure oxygen at high pressures because, says M. Corne, volatilisation is impeded and at a certain limit becomes too slow to ozonise the oxygen. Gases which hinder the formation of ozone also prevent phosphorescence.

BAEYER (*Berichte*, xv. 2856) has obtained nearly pure indigo blue by acting on a solution in acetone of ortho-nitro-benzaldehyde. Acetone and nitrobenzaldehyde react to form a condensation product, $C_{10}H_{11}NO_4$, from which alkali withdraws the elements of acetic acid with production of indigo-blue, thus—

$$2C_{10}H_{11}NO_4 + 2H_2O = C_{16}H_{10}N_2O_2 + 2C_2H_4O_2 + 4H_2O.$$

J. HORBACZEWSKI (*Berichte*, xv. 2678) has obtained uric acid by heating together glycocoll and urea to 200°-230°; details of the reaction are promised.

THE working of the Food Adulteration Act for the year 1881 is considered in a Report of the Local Government Board lately issued in a Blue Book, and published in *The Analyst* (vii. 218). The total number of districts in which analysts were acting at the close of December 1881, was 260; during the year 17,823 samples were analysed, of which 2613, equal to 14·7 per cent. were reported as adulterated; in 1877, 14,706 samples were analysed, and 19·2 per cent. reported as adulterated. More than a third of the samples analysed, and more than a half of those reported against, were of milk. Birmingham still "maintains the distinction which it has for some years enjoyed, of having a larger proportion of its milk reported as adulterated than any other great town in the kingdom." The adulteration of bread and of butter seems to be steadily on the decrease; in coffee the proportion of adulteration is rather less than last year; chicory is still the commonly used adulterant. The adulteration of sugar is practically a thing of the past. More than one-fourth of all the samples of spirits examined were reported as adulterated, chiefly with water: a good deal of gin is sold containing not much more than 20 per cent. of alcohol.

PROF. HOFMANN describes in the *Berichte* (xv. 2656) a number of interesting lecture experiments. To determine that no loss of matter occurs during combustion, he employs a two-litre flask fitted with a cork carrying a small manometer, a glass tube with stopcock, and a straight piece of rather wide tubing to the under-end of which a small porcelain crucible is attached. The wide tube is closed by a cork, about half a gram of dry phosphorus is placed in the little crucible, a portion of the air in the flask is pumped out, and the flask—and also a little bit of stout copper wire—is counterpoised; the little bit of copper wire is heated and dropped down the wide tube, from which the cork is withdrawn for a moment; the phosphorus is thus ignited; after the combustion, which proceeds slowly, is completed, the flask is found to weigh the same as before; the stopcock is now opened, air rushes in, and the flask now weighs more than it did at the beginning of the experiment.

To illustrate the great difference between the volumes of equal weights of liquid and gaseous water, Dr. Hofmann employs a glass bulb of about 300 c.c. capacity, with a narrow glass tube at each end, the upper tube being fitted with a stopcock. This apparatus is supported so that the lower tube reaches to about 1 centim. from the surface of the mercury in a basin; a rapid current of steam is passed into the apparatus; after five minutes or so, when every trace of air is expelled, the stopcock is closed, and at the same moment the lower tube is pushed beneath the mercury, which at once begins to rise into the bulb; after a little time the bulb is almost filled with mercury, on the surface of which the condensed water appears as a thin layer.

VERY simple apparatuses are also described for containing considerable quantities of liquefied gases: *e.g.* SO_2: for exhibiting *quantitatively* the reactions on which the manufacture of sulphuric acid is based; and for demonstrating the law of Dulong and Petit. For descriptions of these, and for other experiments, reference must be made to the original paper.

THE HYPOTHESIS OF ACCELERATED DEVELOPMENT BY PRIMOGENITURE, AND ITS PLACE IN THE THEORY OF EVOLUTION[1]

II.

THE problem before which we are here placed may be formulated as follows:—How is it, that while the tendency to vary which obtains in all organised beings, and which forms one of the foundation stones of the theory of evolution, how is it that this tendency has exerted upon a number of living beings a so much less considerable influence than upon others, so that even in the present day numerous representatives are found of the most primitive animal groups which belong to the oldest known in the geological succession?

Still more, why are there certain genera which, since the Silurian period, appear to have undergone a stagnation in their development, in their advance towards higher differentiation, whereas within a much shorter period the whole of the living mammalian fauna has developed out of more primitive vertebrates and the important modifications have taken place among these mammalia which have finally led to the appearance of the elephant on the one hand, and of the shrews on the other?

In other words, can it be assumed that this tendency to vary could be totally and persistently neutralised by other causes amongst whole series of living beings during thousands of years, whereas during the same number of years this tendency, aided by natural selection, could lead other series of animals along roads where they have advanced with gigantic strides?

I need not remind you that this objection against the theory of

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[1] By Prof. A. A. W. Hubrecht. Inaugural Address delivered in the University of Utrecht. September, 1882. Continued from page 281.

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